

CIF 22-2: Effects of Residual Water System Silver on Space Crop Microbiome and Nutrient Content

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Executive Summary: Ionic silver (Ag^+) is being investigated as a residual biocide for use in spacecraft potable water systems on future crewed missions. In addition to providing clean water to the crew and other life support system functions, the potable water is used to irrigate space crop production units such as the Vegetable Production System (Veggie) and the Advanced Plant Habitat (APH). We have evaluated the impact of different concentrations of Ag^+ biocide solutions in comparison to a control in both substrate (arcillite-based) and substrate-less (hydroponics-based) growth set ups. Here, we provide evidence that increasing the concentration of silver in the irrigation water impacts the root zone microbiome in both setups, with plant growth and elemental nutrient content also affected in the hydroponic set up. This suggests a need for a silver removal step to achieve acceptable silver levels in irrigation water before application to space crops in a substrate-less hydroponics system. This removal step is also recommended for a substrate-based system, although it is not as critical as in a hydroponics system.